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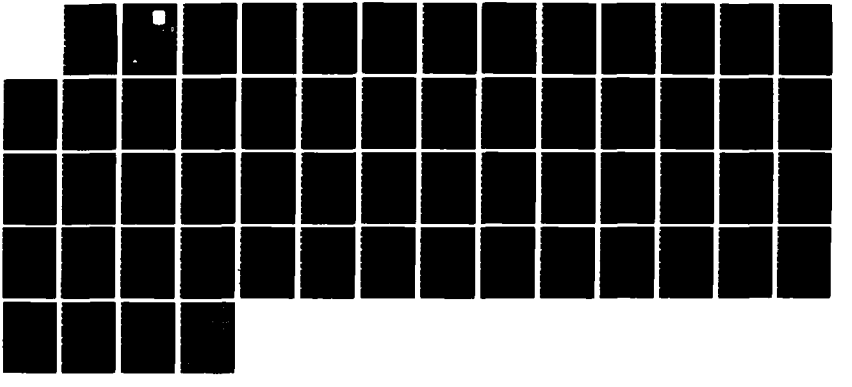

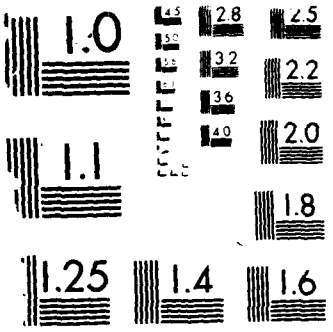

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STUDY PROJECT

THE ARMY EXECUTIVE AND THE COMPUTER

BY

MS. MIRIAM F. BROWNING, DAC

30 MARCH 1987

US ARMY WAR COLLEGE, CARLISLE BARRACKS, PA 17013

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USAWC MILITARY STUDIES PROGRAM PAPER

THE ARMY EXECUTIVE AND THE COMPUTER

AN INDIVIDUAL RESEARCH PROJECT

by

Ms. Miriam F. Browning, DAC

Lieutenant Colonel David A. Brown, OD
Project Adviser

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US Army War College
Carlisle Barracks, Pennsylvania 17013
30 March 1987

ABSTRACT

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The management of information is a critical executive responsibility. This is especially true in the public sector where information not money is the medium of exchange. For the Army executive, on the battlefield or in an office, the computer will continue to influence strategy, performance, and resource decisions. Traditional executive tasks such as strategic planning and resource aquisition and spending are examined in light of information management. In addition, newer executive responsibilities, orchestrating the implementation of end-user computing and assuring a positive people-computer environment, are presented. These basic executive responsibilities are framed within the context of systems thinking.

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INTRODUCTION

The management of information may well be one of the most critical tasks an executive faces. This is especially true in the public sector where information not money is the medium of exchange. For the Army executive, on the battlefield or in an office, the computer will continue to influence strategy, performance, and resource decisions.See NOTE below.

While the computer brings greater speed and precision, it also brings more complexity and constant change. Executive commitment, therefore, is critical in making computers do their jobs. This commitment can no longer be delegated, or worse, abdicated to the technologists who can well manage the pyrotechnics but not the entire 4th of July celebration.

The daily information business of the executive involves a number of activities. Two traditional managerial activities are planning for the organization's information needs and

NOTE: Computer definitions often are as difficult to understand as the concepts they embody. For the purposes of this paper, the following definitions are applicable:

Computer. A generic and symbolic concept encompassing the technological (hardware, software, communications) persona of an automated system.

Information Management. Classic management roles and responsibilities as applied to (1) the Army Information Mission Area's (IMA) five functional disciplines (automation, telecommunications, visual information, records management, and printing and publications) and (2) the information resource itself, i.e., the meaningful output produced by an information system, automated or manual.

allocating and controlling computer resources. In addition, today's computer-rich environment demands that the executive be responsible for successfully introducing end-user computing to the work force such that it improves individual performance while at the same time adhering to organizational compatibility standards. Last, but most important, the executive is committed to creating a positive relationship between the computer and the people who work with it. The context in which the daily information business is conducted involves system thinking, that is, the ability to comprehend the whole and envision the future.

The power and potential of the computer are extraordinary. Specifically:

> The first electronic digital computer built in the U.S., ENIAC, was unveiled at the University of Pennsylvania in 1946. It weighed 30 tons, filled the space of a two-car garage, and contained 18,000 vacuum tubes, which failed on average at the rate of one every seven minutes. It cost half a million dollars at 1946 prices.
>
> Today, the same amount of computing power is contained in a pen-sized silicon chip. Put another way, if the automobile and airplane businesses had developed like the computer business, a Rolls Royce would cost $2.75 and run for three million miles on one gallon of gas. And a Boeing 767 would cost just $500 and circle the globe in 20 minutes on five gallons of gas.[1]

Yet, despite the spectacular achievements of the computer, the executive will fare much better in this information age with the fundamental wisdom that the tough thinking and innovation of the human being are what makes the computer work.

CHAPTER I

SYSTEMS THINKING IS THE KEY TO SUCCESS

> Whenever I draw a circle, I immediately want to step out of it.
>
> R. Buckminster Fuller

A knowledge of systems thinking is important to understanding the computer. Not only is the computer itself a system, but the behavior and changes it produces make sense only when viewed from a systems not analytical perspective.

SYSTEMS FUNDAMENTALS

In the simplest terms, a system is a set of objects with relationships connected to each other and their environment so as to form a whole. Figure 1 is a diagram of a system. A system is dynamic and has a number of characteristics. First, it is goal-seeking, that is, it has a purpose. Next, it is holistic meaning that one focuses on the whole not the parts when thinking about it. The parts of a system are interdependent and lose their meaning if analytically decomposed. Inputs and outputs are the activities needed to produce the system's goals, and the actual processing of the system (whether the computer's "black box" or a leaf's photosynthesis) transforms inputs to outputs. Feedback is the control aspect of the system. It ascertains differences between the system's stated goal and actual performance. A final but important system characteristic is entropy, the tendency towards disorder or death in the system.

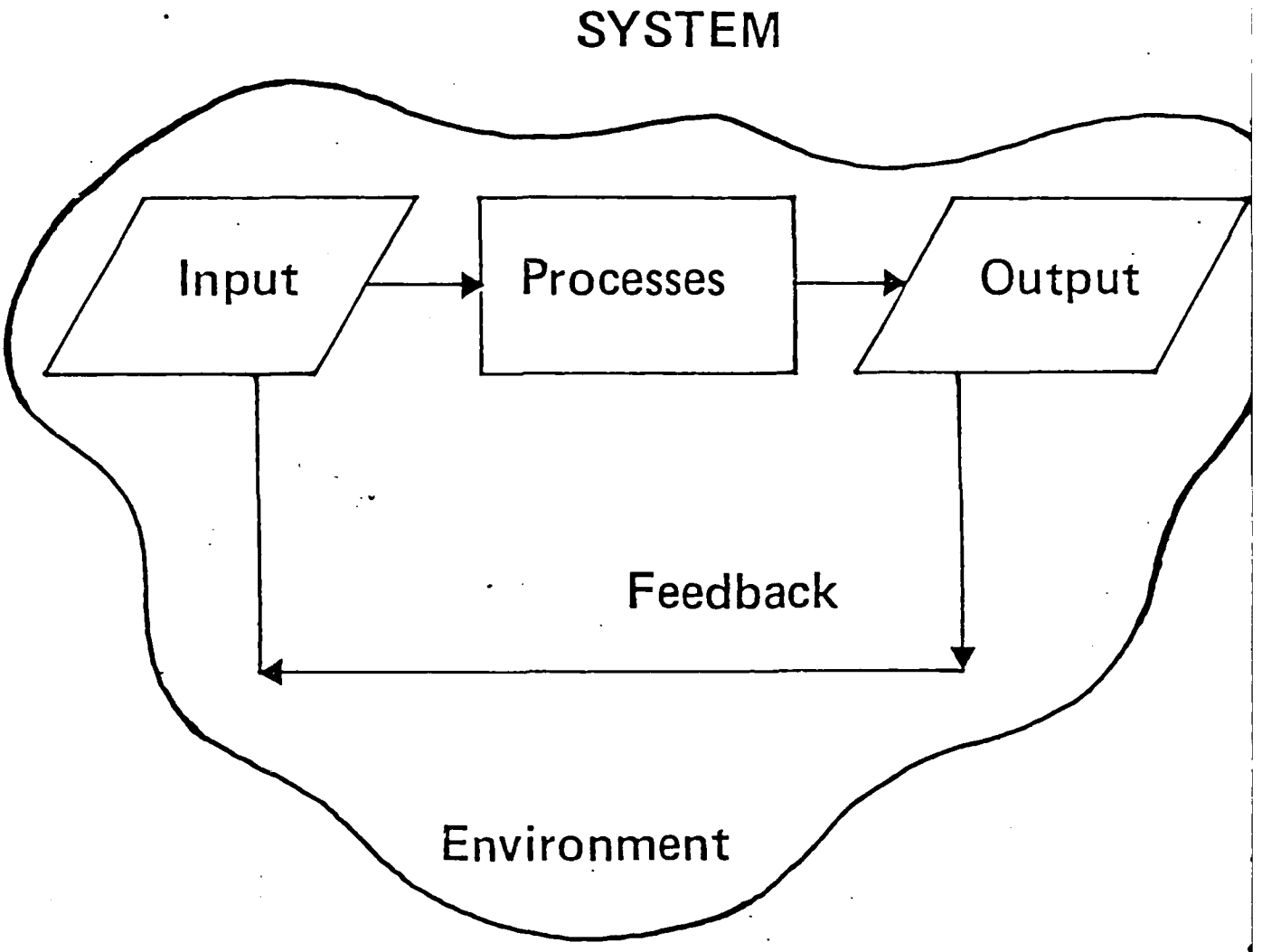


Figure 1.

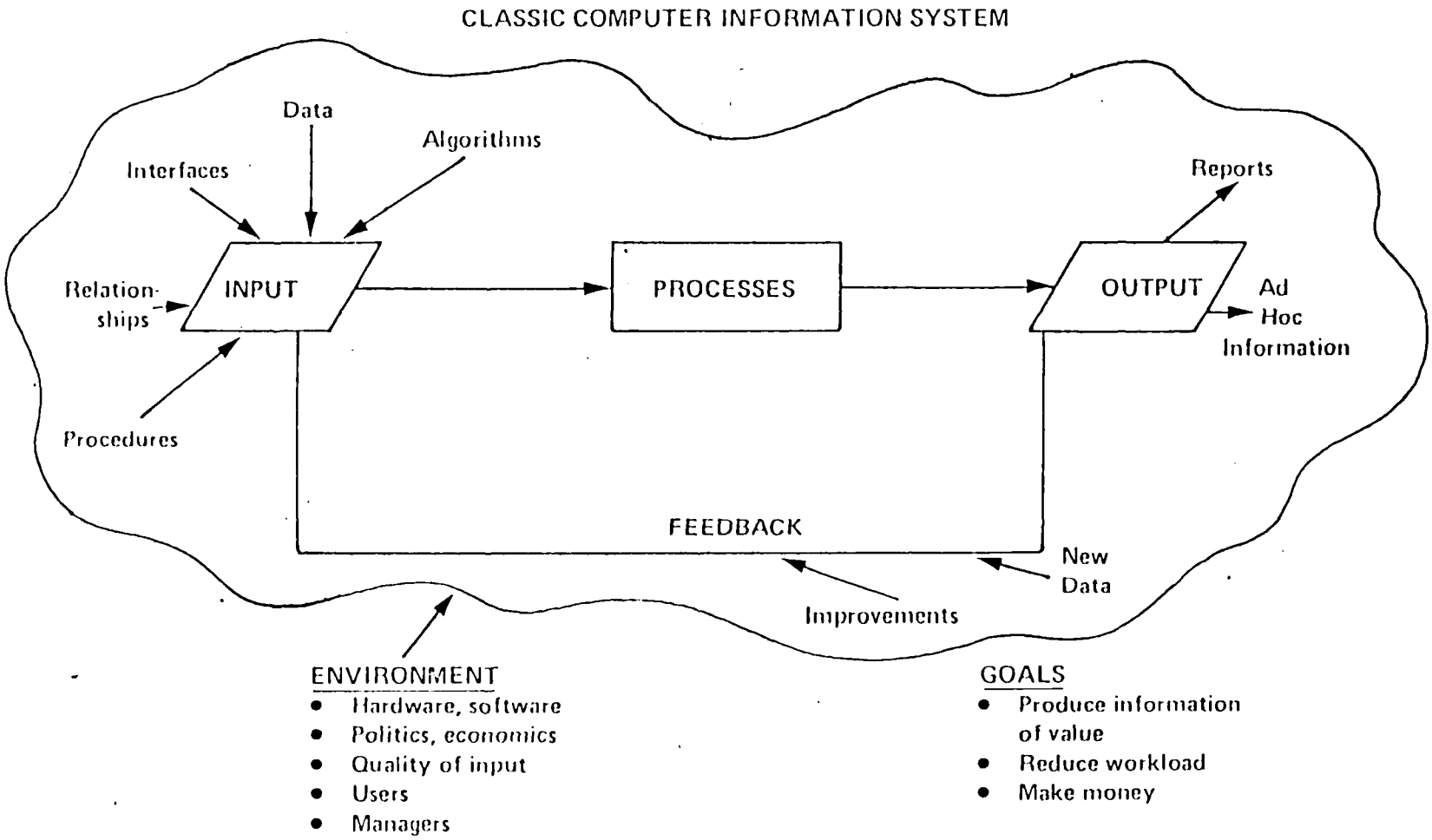
Entropy is prevented by introducing new energy or information into the system.[2] The decline of the American automobile and steel industries in world markets well illustrates the concept of entropy. Had new visions and solutions been infused into their systems, these industries would probably not be dying today. Figure 2 illustrates a classic computer system. Note that the important aspects of the computer system deal with context and relationships, not with technology components such as hardware or communications.

Because most executives are schooled and experienced in the analytical method of problem solving, a contrast of the systems versus analytical approaches is presented in Figure 3. The purpose in presenting these two scientific approaches side by side, again, is to permit the executive to consider the merits of, if not refocus towards, systems thinking in managing the information environment. An insightful executive will strive for an adequate knowledge of the whole rather than an accurate knowledge of the parts.

Even more important than viewing information from a systems perspective is the executive's ability to use systems rather than analytical leadership skills to direct work and people and to understand organizational issues. Systems leadership emphasizes synthesis and integration, a future vision, and the search for and structuring of interdependencies. The four major tasks of the systems executive are:

1. Setting vision
2. Designing interdependencies

Figure 2.


CLASSIC COMPUTER INFORMATION SYSTEM
Data
Algorithms
Interfaces
Reports
Relation-
ships
INPUT
PROCESSES
OUTPUT
Ad
Hoc
Information
Procedures
FEEDBACK
New
Data
Improvements
ENVIRONMENT
Hardware, software
Politics, economics
Quality of input
Users
Managers
GOALS
Produce information of value
Reduce workload
Make money

CONTRASTING TWO SCIENTIFIC APPROACHES

ANALYTICAL	SYSTEMS
1. Whole is the sum of it's parts	1. Whole can be more than the sum of its parts (synergy)
2. Causes are of interest	2. Consequences are of interest
3. Organized simplicity, unorganized complexity	3. Organized complexity
4. Towards disorder	4. Resist disorder by importing energy/information
5. Parts viewed in isolation	5. Parts are independent
6. Algorithimic	6. Heuristic

Figure 3

3. Creating climate

4. Establishing information systems

Setting vision or establishing organizational goals involves looking into out five, ten, or even fifty years into the future to discern possibilities. Once this vision has been generally determined (and by the demands of environment, organizational change, and technology it will always by dynamic), it is necessary to share and infuse that vision throughout the organization. To make it work, the vision needs to be acted on in a prioritized and consensual manner.

Designing interdependencies first involves defining the critical elements in the organization and making sure they communicate with one another. In architecting these interdependencies, the executive must be aware that they are fluid and changing because of the nature of the environment in which they work. Adding a third dimension, the executive needs to recognize the multiple effects of taking action on these interdependencies. The frame of reference, therefore, in making decisions becomes larger in scope and more complex in depth.

Creating climate is to establish and abide by a positive (to the average worker as well as to the executive) organizational culture. Instead of publishing lengthy regulations and manuals on management and leadership, perhaps the Army would be better off with a simple rallying point such as the Navy's 600 ships or IBM's three rules of corporate life: provide excellent service to customers, respect the individual, and get the best price/product from suppliers. Context may be more important than content.

Finally, building information systems means establishing relevant information networks so as to make decisions and direct operations. Information systems also act as a guard against entropy by importing new data and measuring performance.[3]

So why are all those metaphysics necessary? The computer is just a mechanical machine which crunches numbers fast. Work is done more quickly. Everything is in order and if there are any problems I can call on the computer people to fix them. So says the executive who is not persuaded that systems thinking has any relevance to his/her daily way of doing business. The following fictitious case study is presented to illustrate how the same situation can produce decidedly different results depending on whether it was viewed in an analytical or systems context.

A CASE STUDY

Two large military widget manufacturing corporations, Analyst Widgets Inc. and Systems Widget Corp., are considering spending close to one billion dollars each to install four regional data processing centers across the U.S. to handle their corporate housekeeping functions, e.g., personnel, payroll, supply, finance and accounting, marketing, etc. Source data will be input to these regional data centers from over 50 field offices nationwide. Corporate proponents have justified the system based on several reasons. The computers at the field offices are becoming technologically obsolete and are unable to handle the estimated increase in data processing workloads for the housekeeping functions over the next ten years. Replacing

them with large regional computers which will always be configured as state-of-the-art hardware will capitalize on economies of scale and do away with the need for computers at the 50 field offices. In addition, dozens of data processing personnel at each field site will no longer be needed because their jobs will be done at the regional data centers. Although cadres of data processing personnel will be at each regional data center, the corporation can save, on net, approximately 1200 people. This manpower reduction looks good as economic times are not the best.

The Analyst Widget Inc. View and Consequences

Founded over 100 years ago by August Analyst, Analyst Widget Inc. is the model of the centralized, conservative bureaucracy. Its corporate philosophy heavily favors centralization for planning and control and, to the extent that it can, it imposes centralized decision making on its field offices. The IM department has the traditional mainframe orientation towards the development of computer systems. Top management, in general, does not have either a strong interest or much knowledge in computer systems despite the fact that these are an increasing portion of its budget. They have abdicated all decisions involving computers to the IM department.

Based on the strong arguments posed by the IM department that dollar costs and personnel will be reduced if the concept of the regional data centers is implemented, top management approves the concept. Great fanfare throughout the organization and gala ribbon cutting ceremonies mark the beginning of a new era for

Analyst Widget Inc. as the regional data centers come on line and begin their work.

Five years later, Analyst Widget Inc. is close to bankruptcy. Huge problems arising from the original regional data center concept have crippled the system. The corporation has lost substantial market share in the military widget business, and three top managers (the head of the IM department, the corporate vice president who approved the original concept, and the chief organizational systems consultant) have been fired. What went wrong?

Corporate management viewed the new computer system and its organizational system as unrelated and from a one dimensional, dollars and cents only view. For both systems, they failed to envision a number of critical essential parts - communications, software, the growing world of office automation and end-user computing, and the changing computer skills needed to operate a nationwide computer network. This meant that although data could flow from an office site to a regional data center, the regional data centers couldn't talk to one another. When the corporate vice president for personnel asked how many college graduates she had that could speak Japanese, her staff indicated the only way they could do this was to get printouts from each of the regional data centers and manually tabulate the data. The system's inability to communicate internally was exacerbated by the fact that even though the big housekeeping software systems were run on state-of-the-art hardware, the software was circa 1960. Again, when the corporate vice president for finance asked for comparative productivity statistics between Analyst Widget Inc.

and Systems Widget Corp. he was told that although the data were in the system, it would take four months and a high priority to get them.

Meanwhile back at the field offices, users were clamoring for more computing power. They wanted powerful minicomputers and personal computers in all manners of local area networks to satisfy their word processing, electronic mail, and local data base needs. These needs were legitimate but independent from the corporation's housekeeping information needs which were satisfied by the "big system." Finally, decimated in the data processing personnel ranks, the field offices were valiantly struggling with the new technology related skill demands that the regional data centers were imposing on them. These skills included communications specialists, data base managers, more clerks, and road runners (people who ferried tapes, punch cards(!), and printouts between the field office and the regional data center since they was no way electronically to input or output data). Field offices cut back on their professional hires to feed and survive with the new system. Thus, ironically, the twin justifications of dollar and people savings not only did not prove true; but, in fact, cost the corporation more. Sadly, too, executives continued to ignore these problems as their corporate mindset never waivered from the hardware fix or never seriously listened to the groundswells for change from the field offices.

In sum, had Analyst Widget Inc, at the onset, envisioned what the total system would demand it could have altered its original plans so as not to become a failing corporation.

The Systems Widget Corp. View and Consequences

Systems Widget Corp. is a newcomer to the market, founded in 1979 by Sarah Systems who was the inventor, on paper only, of the first hand held computer. (Her first company, Chips, is still in the R & D business trying to develop the idea.) Systems Widget Corp. is a paradigm of the company dedicated to excellence as "In Search of Excellence." Although the corporation favors ntralized planning, it operates using a decentralized, power ilosophy. It has a lean staff, simple organization, and listens to and rewards its rank and file. It has a dual mission - to be able to be the best in the military widget business and to respect its people and its customers. The IM department is an integrated one of data processing and communications specialists who are equally comfortable with mainframe and end-user computing. Executives are actively involved in understanding and implementing successful information systems as they believe this will definitely increase their market share and profits in the business.

When the IM department originally proposed the regional data center concept to solve the housekeeping systems problems, top management (which included heads of all the 50 field offices) spent two months digesting and critiquing the concept. At the end of that time, they did not have a solution but did have a list of what they felt were exhaustive questions which went to the boundaries of the system and beyond. The answers to these questions, they believed, would assure the development of the right system. A partial listing of those questions is as follows:

1. What will be the technology trends over the next ten years and how will they influence the proposed regional data center concept?

2. What are the telecommunications needs of the users and the system?

3. What is the status of the software to be put on the hardware? What are the risks (financial, technological, personnel, etc.) if the hardware is state-of-the-art but the software is not?

4. What will be the computer/communications needs and interfaces at the 50 field sites once the regional data centers are in place?

5. What better information can top and line management get out of the new system that they could not get out of the old system? In other words, what are the critical corporate information needs?

6. Looking at the whole project over ten years, what will be the hardware, software, communications, and manpower costs and tradeoffs?

7. How can we optimize system implementation such that all components (hardware, software, communications, dollars and cash flow, new or retrained personnel) are considered in relation to one another and to the prioritized, critical information needs of the corporation.

8. What are time options for optimized implementation of the system?

9. What should be the growth estimates for the system at 20 years from the start of its implementation?

After rigorous corporate soul searching, Systems Widget Corp. decided that the basic regional data center concept was sound, but that to implement it solely considering hardware needs would be disastrous. In addition, the corporation could not honestly say that the new system would save manpower (due mainly to end-user computing needs at the field sites), nor could they count on dollar savings in the short term, one to five years. The solution proposed was an implementation one based on the corporation's financial commitments over the next ten years and an optimized systems configuration which sequenced the completion of hardware, software, and communications components so as to minimize the disruption of information services to the users.

Five years later, at the same time Analyst Widget Inc. was filing for bankruptcy, Systems Widget Corp. had installed the last communications link in the system and completed the last newly designed data base management system which completed the upgrade to state-of-the-art for its software systems. Financial estimates indicated that the corporation had only six months to go to reach the break-even point. After that, the system would start leveraging profits for the corporation. This was a particularly appealing situation since Systems Widget Corp. was now in a strong competitive position to take over much of Analyst Widgets Inc's market share. A further cap in the feather of the system's implementers was the fact that because the system was built for a 20 year span, excess computer and communications capacity was sold on the open market. This enabled the corporation to reach its break even point earlier than expected.

In sum, by envisioning the total system, Systems Widget Corp. was able to build a successful and profitable system in line with corporate and client needs.

CHAPTER II

THE EXECUTIVE IS COMMITTED

> Those who stick too much to small things normally become incapable of great things.
>
> La Rochefoucauld
> Maxims (1665)

Two information management areas directly affecting the daily life of the executive are strategic information planning and executive work stations.

STRATEGIC INFORMATION PLANNING

Strategic information planning developed in the 1970's in response to management's need to control and share the data generated by the organization's variety of functional users. If someone wanted to know how many battalions there were in the Army, the answer more likely than not would depend on how many systems (computer and manual) the questioner tapped rather than, necessarily, the correct answer.

One of the most representative methods in dealing with strategic planning is IBM's Business Systems Planning (BSP) or, as it is called in the Army, Information Systems Planning (ISP). The purpose of ISP is to have senior managers in the organization get together in isolation for several weeks or months depending on the organization's size and complexity to define and prioritize the information needs of their organization. The concentration is on how the organization runs and what business

processes are important not on technology and systems applications. When the executives have completed this review, the technologists then step in and begin developing application systems (preferably in a data base management system configuration composed of the latest high tech hardware, software, and communications). From a conceptual data management point of view, ISP views information horizontally across the organization rather than vertically or in a stovepipe fashion. The purpose of this integrative look at data is to recognize data redundancies so as to optimize and streamline the cost of information in terms of time, money, and accuracy. In other words, if system X is the authoritative one for numbers of battalions in the Army then there is no reason to put that data indiscriminately in other systems. Conversely, system X must be accessible by other systems so they can use this authoritative data.

ISP results in the Army and private corporations have been mixed. On the plus side, ISP serves as a catalyst in an organization to acknowledge and resolve the changing demands of information and to get top management committed. ISP is mission not technology oriented and looks at information as a corporate resource. It views systems applications as related to one another within the overall framework of an organization's mission and information needs. ISP also involves top executives, for the first time in many organizations, in taking a direct part in information management. ISP also has its limits. It is a highly procedural and time consuming process. It seems to work best in

centralized organizations which can easily acquire the hardware and software needed to implement the complex data base solutions ISP demands. Some organizations have up to four ISP studies collecting dust on shelves meanwhile information processing goes on. Generally, the more successful ISP efforts have been in smaller, less complex organizations or functional areas who chose limited, less ambitious goals for their ISP studies rather than grandiose final solutions. ISP developers proclaim the new information era of shared data. ISP cynics state that the method is a marketing ploy by IBM to gain access to more top managers, not just the IM departments, for their products and services. Perhaps, ironically, ISP as a strategic information planning method may have been done in by that which it seeks to control, technology. Decentralized, end-user computing not the mainframe focus of ISP is the information trend of the future.

If not ISP, then what? What kind of strategic information planning is likely to best meet the future information needs of an organization. In a recent study of information systems planning efforts at 37 major U.S. corporations, four technology planning environments were characterized. These environments correlated to the infusion and deployment of information technology in the organization. Infusion refers to the degree to which information technology has penetrated a company in terms of importance or impact. Deployment refers to decentralization or the degree to which technology is disseminated throughout the organization. The study found that certain technology planning tools worked best in specific environments. For example, ISP was of the most value in those organizations in which information

management had become strategic to the company and information was centralized in the manner of its deployment.[4]

This study indicated that more and more organizations were moving to a complex environment in which both the infusion and deployment of the information are high. Significantly, there are no readily available strategic information planning tools for such an environment. However, a number of tentative guidelines are offered for survival. These include:

1. Change organizational behavior. Delegate routine and single use systems development to functional or operations areas instead of to the IM department. Educate and encourage workers in the new technology of end-user computing and networks. Experiment with the new technologies in an atmosphere that rewards change and innovation not the control of information.

2. Focus on service improvement. (The study dealing with corporate America referred to this as a focus on product improvement. Thus, the analogy in the public sector would be on service.) Add value to the more conventional or mundane services of the organization by using the technology in an innovative manner. Examples could include telecommunicating rather than typing and mailing a monthly data intensive report to higher headquarters; experimenting with a telecommuting program for a portion of the work force.

3. Recognize the importance of networking resource management. Coordination of information exchange in an organization is becoming a dominant concern. As work stations and communications networks proliferate, the focus of the

organization needs to shift from data processing to data transfer. Assuming the accuracy and reliability of data, timing and location of data now become prime considerations.

4. Develop an information systems architecture. Such an architecture is composed of rules and standards for information processing, data management, and communications. The requirements and relationships of these different parts of the whole information system are more important than any individual part. Strategic combinations not single applications are critical.

5. Avoid irrelevant planning. Information planning for informations planning's sake has no merit. It must be related to the organization's mission and services and take into account management innovation and technology trends.[5]

EXECUTIVE WORK STATIONS

The verdict is still out on executive use of the desktop computer. A recent market research study by International Resource Development Inc. concludes that senior executives basically shun personal computers and rely on their subordinates to provide summaries of important information.[6] In the Army, one could say that to increase executive/commander productivity decrease the micromanagement of higher headquarters rather than put voice recognition and keyboard-less terminals on executive desk tops. Yet, there are other executives who rave about desk top computers for complex analyses of corporate data, the ability to quickly provide graphical representation of data, and increased productivity as a result of a greater comprehension of

the organization's processes. Some executives are wizards at thinking and communicating ideas and questions across computer networks. They are comfortable with the power and speed of their desktop computer and may even intimidate subordinates into using the computer to respond to their questions.[7]

There are a number of significant barriers preventing the executive from embracing and using the computer as an integral part of his/her working life. First, management behavior is not typically compatible with computer behavior which is precise, logical, and organized. Management behavior looks "less systematic; more informal, less reflective, more reactive, less well-organized and more frivolous than a student of strategic planning systems, MIS (management information systems), or organizational design would ever expect."[8] Second, the computer does not have the capability to predict the future, a major daily consideration of the executive. Third, the computer cannot tell everything that is happening in an organization. In fact, most of the critical information required by the executive is never on the computer.

In contrast to this evidence that the executive has little need of desk top computers, there are numerous articles in the newspapers and journals recounting examples of ways that company presidents use personal computers. Budgeting errors are discovered, new marketing ideas are identified, and exploratory analysis of company operations are made with a resultant increase in profits to the company. It is interesting to note that none of the examples of executive use of desk top computers involved

the use of electronic mail or word processing applications. Two experiments with these types of executive work station applications failed at a major Army headquarters. In the first experiment, the Chief of Staff directed that all Deputy Chiefs of Staff would have a communicating computer on their desks. The objective in doing this was to familiarize these executives with computer technology and to enable them to communicate with one another on important command matters. One year later, none of these executives (or their replacements) was using the desk top computer and the new Chief of Staff remarked, "It looks great on my desk but it hasn't done a damn thing to clean out my in box." The second experiment involved placing executive work stations on the desks of division chiefs in a functional area. At first, the computer was a status symbol regardless of whether it was used. Again, the computers were minimally, if ever, used and by the end of the year most of these executive computers were redistributed to staffers who could use them more profitably in their daily work. In both these experiments why didn't the executives use the computers? The two main reasons were that the computer did nothing to improve the executive's productivity and the computer had little relevancy to the daily needs of the executive. In addition, the software used in these executive networks was not user-friendly and that fact probably negatively affected executive perceptions of the value of the computer.

In sum, the decision to put desk top computers on the executive's desk should be made by each individual executive. Nothing is more wasteful than the forced placement of PCs on executive desks for prestige or symbolism. Likewise, the

executive who will truly use a desk top computer should be given one and encouraged in his/her endeavors. For the interested but still unsure executive, the decision to use a personal computer in the office should be based on answers to these three questions:

1. What will I use a personal computer for?
2. Will the personal computer improve my productivity or enable me to make better decisions?
3. Can I more easily get the information I need from other sources?[9]

CHAPTER III

INFORMATION ISN'T FREE.

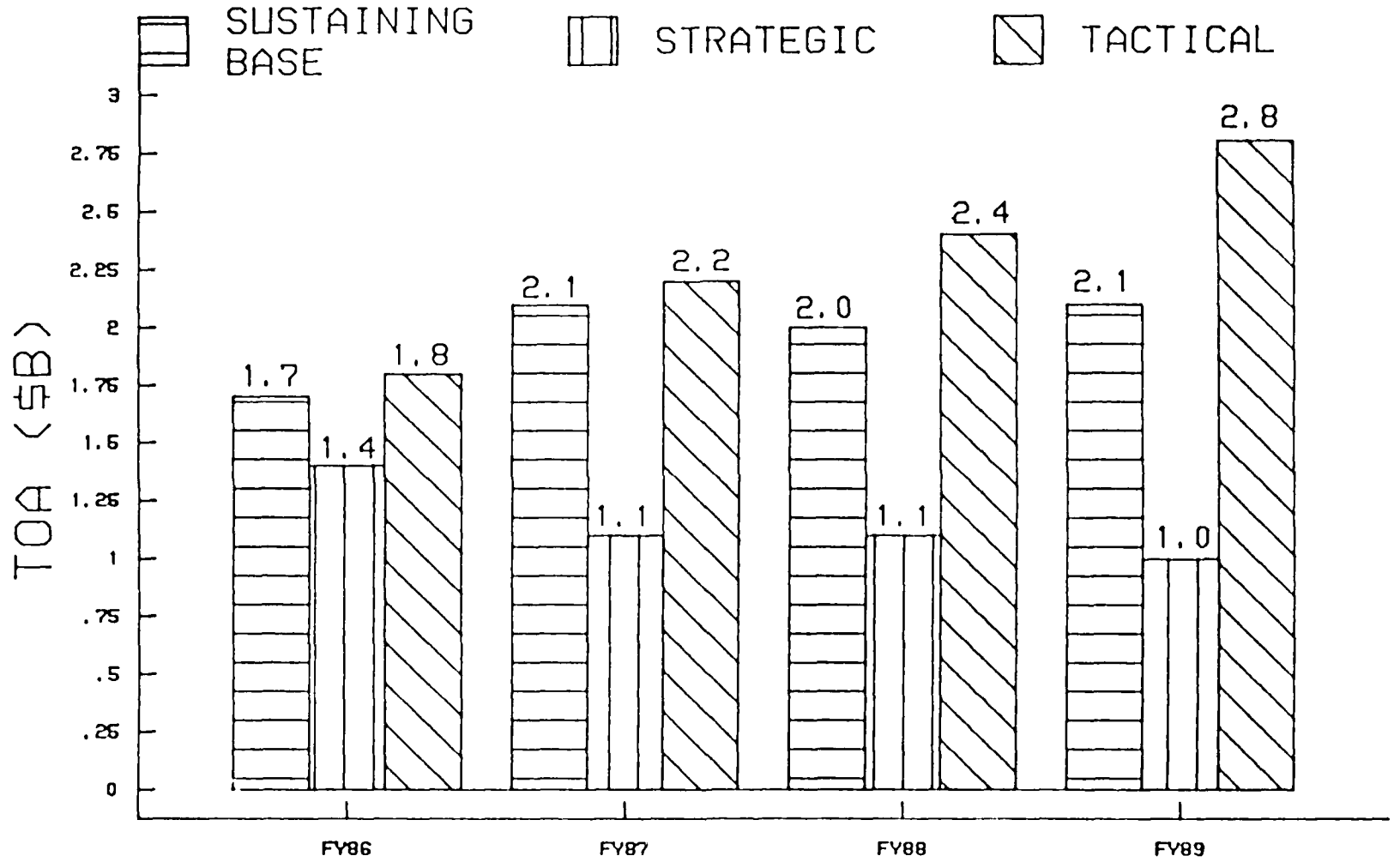
"A billion here and a billion there. Pretty soon it adds up to real money."

Senator Everett Dirksen

Information has always cost money. The dominating cost in the early years of information processing was hardware. Today, the critical computer costs are software and communications. The reasons for this are: miniaturization of computer circuits, the widespread use of microchips, and the migration of computers from their glass enclosed cages in the data processing department to desktops everywhere. In addition, as users become more sophisticated in their needs and as users want more information services, the organization's information budget has the potential to increase dramatically.

Market researcher, International Data Corporation, (IDC), concludes that from 1982 to 1984, American corporations raised their computer budgets 18 1/2% annually.[10] Similar figures exist for the Army but for a different time frame. The total obligation authority (TOA) for information management for FY 86 is $4.9 billion, the same figure estimated for FY 89 is $5.9 billion, an increase of approximately 17%.[11] Figure 10 illustrates this growth rate. Figure 11 illustrates how this TOA is distributed among the Army's major information components. However, this growth rate at least in the corporate world is

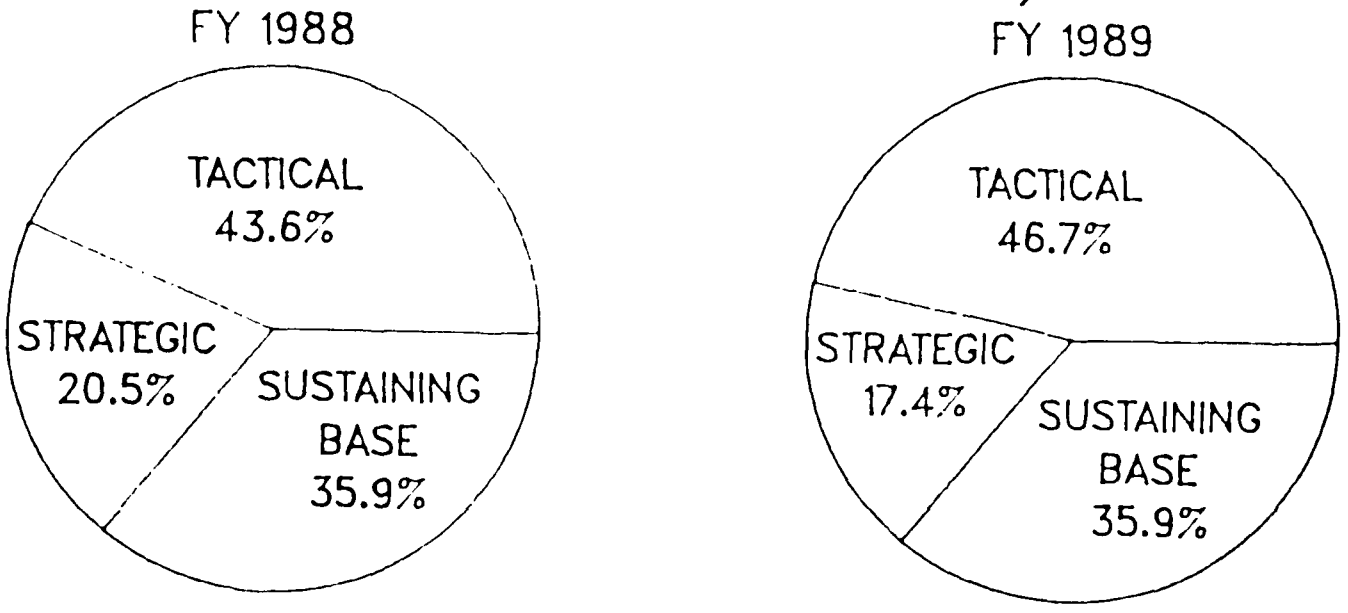
Figure 4



THE OFFICE OF THE ASSISTANT CHIEF OF STAFF FOR INFORMATION MANAGEMENT AND THE INFORMATION SYSTEMS COMMAND ENSURE INTEGRATION OF ALL ASPECTS OF THE ARMY INFORMATION MANAGEMENT PROGRAM WHICH INCLUDES AUTOMATION, TELECOMMUNICATION, VISUAL INFORMATION, RECORDS MANAGEMENT, AND PRINTING AND PUBLISHING. ARMY INFORMATION MANAGMENT IMPROVES THE QUALITY AND FLOW OF INFORMATION AVAILABLE TO THE ARMY

Figure 5

PERCENTAGE BY CATEGORY
(TOTAL OBLIGATION AUTHORITY)



TACTICAL

- SATELLITE TERMINALS
- TRI–TAC
- SPECIAL OPERATIONS FORCES COMMUNICATIONS
- SINCGARS
- MOBILE SUBSCRIBER EQUIPMENT (MSE)
- PLRS–JTIDS HYBRID (PJH)
- TACCS
- CTASC

STRATEGIC

- WWMCCS
- SATELLITE EARTH TERMINALS
- SUPPORT TO CINCS
- DEFENSE DATA NETWORK
- NAVSTAR GPS

SUSTAINING BASE

- BASE COMMUNICATIONS
- VIABLE
- VISUAL INFORMATION
- TELEPHONE UPGRADE
- LIFE CYCLE SOFTWARE SUPPORT
- RESERVE COMPONENT AUTOMATION SYSTEM (RCAS)

slowing down. In specific corporations, cost cutting in information technology and services has been dramatic. SmithKline Beckman, one of the nation's largest pharmaceutical companies, increased its ADP budget only 6% in 1986 compared with 25% annual increases in the first half of the decade. Other large companies such as AT&T and Pittsburgh Plate Glass are also cutting their ADP budgets. Decreasing corporate ADP budgets reflect the use of standardized-off-the shelf software vs. customized in-house produced software and different hardware configurations for buying new computers. In addition, personal computers are now providing solutions to information systems which formally were the domain of mainframes.

Computer cost cutting measures are being taken by those private corporations which basically have all the computers they need to perform their operations. The issue now in these computer mature organizations is how to make all the computers work better. Typical measures include eliminating little used reports, putting idle computers to use on priority projects, rejecting computer purchase requests that would have been rubber stamped in the past, and buying used instead of new mainframes.

To effectively cut information costs, the organization must be committed and have a strategy to do so, and more importantly, have a tough minded top information executive to execute that strategy. A case in point is John Blood Jr. at SmithKline Beckman. Steps he has taken to reduce information processing costs include buying used instead of new computer mainframes, when appropriate, thereby cutting costs substantially; running electronic checks on computer terminals and reallocating those

which are used less than 20% of the time (executive work stations are excepted - prestige, not cost, rules in these cases); and rejecting the development of computer applications which can be better accomplished manually. Mr. Blood's ADP department is aggressive in challenging the user's propensity to automate everything without regard to utility or cost. They attach questionnaires to computer printed reports to see if anyone reads them and stop spending reports if demand seems lacking. "You'll find out pretty fast if you guessed wrong," says one department staffer. The company discourages requests for computer equipment costing over $50,000, and these have to be approved by a corporate committee. More complex purchase forms have been designed so that users will have to think about costs.

Other cost cutting strategies at SmithKline Beckman include a changing relationship with computer vendors and the purchase of standardized software. Computer vendors are still courted for their knowledge of new products and capabilities, but the company strategy is to buy older technology with clearly acceptable capabilities thus saving the high costs which typically accrue to new computer technologies. Also, transitioning to newer equipment now is stretched out over time instead of occurring immediately as the new equipment becomes available on the market. The company is buying more off-the-shelf software from either software vendors or other companies. This saves the cost of high salaried programmers and the typically long time it takes to develop a computer system in-house.[12]

The federal Office of Management and Budget has recently put out policy which states that information is a resource to be

costed by the organization. All federal agencies are required to put cost controls into effect to meet the intent of the policy. Two areas in which the Army is cutting information costs are chargeback systems and the buying out of leased computer equipment.

For FY 87 by direction of the Chief of Staff, Army, major Army commands are being charged direct customer payments for local and long distance communications, local automation, printing and publications, visual information and mail machines (CONUS only). Formerly, Information Systems Command paid for these services, but in FY 87 funds were distributed to the MACOMs based on their needs and historical usage rates to pay for direct customer billings. An Army contract investigating chargeback rules and procedures in the private sector will be the basis for recommendations for a comprehensive information cost control program for the Army.[13]

The Army is continuing with its program, directed by Congress, to purchase, when cost effective, automatic data processing equipment and word processing equipment currently programmed to be under lease. The program has resulted in a 36% decrease in equipment lease costs between FY 87 and FY 88 and a 42% decrease between FY 88 and FY 89. To assure that leased equipment is cost effective, Army policy is that leased equipment is subjected to an annual lease purchase analysis throughout the life of the lease, and that future equipment acquisitions will be purchased unless leasing can be shown to represent the lower cost.[14]

The Army's objective behind its compliance with OMB policy is to identify and recover costs associated with information services. This is being done to account for information costs and to guarantee that organizations benefiting from information services will have the necessary information with which to make wise economic decisions regarding their use of information.

CHAPTER IV

END-USER COMPUTING IS HERE TO STAY

Machines should work, people should think.

IBM slogan

End-user computing is the creative use of computers by non-data processing people, namely "end-users." The end-user computing boom continues the evolution of how computers have been used in an organization. In the 1950's & 60's computers automated the large, labor intensive workloads found in accounting and clerical applications. By the late seventies, the computer automated the organization's major operational functions such as financial, personnel, and l ..stics systems. With the introduction of the personal computer in the work place in the early 1980's, the tasks that support staff and managerial needs are now being automated.

The rate of end-user growth will probably continue well into the next century. Current research indicates that the growth rate for end-user computing is at least five times that of conventional systems and that a 50 to 100 percent growth rate per year has been typical. Two examples illustrate this growth:

> At Xerox over 40 percent of the corporation's total computer resources directly support end-users. It is estimated that end-user computing at Xerox will grow 75 percent by 1990.[15]

> In 1982, there were 10 to 15 personal computers at HQ FORSCOM which had an authorized headquarters strength of 1856. In 1986, there were 588 personal computers for about the same amount of authorized manpower. The new FORSCOM Information System (FIS) planned for implementation in 1987 will ultimately support 2000 work stations and will permit end-users access to both classified and unclassified information networks and the ability to integrate PC and mainframe applications.[16]

Because end-user computing is probably the most significant change in how computers are used today, the executive needs to know what end-user computing can do, what are the significant issues, and how to successfully manage this boom.

The main benefit of end-user computing is that it improves individual performance thus leading to two important payoffs for the organization: a competitive advantage and improved internal organizational effectiveness. For the individual end-user, computing accelerates job learning so that the individual is motivated to tackle and explore tasks such that more productive and innovative results occur. This in turn provides the organization with a job better done by many of its workers.

Just as Henry Kissinger declared that successful foreign policy is based on an accumulation of nuances so it is with end-user computing. Progress and excellence in an organization can be the cumulative result of small improvements made by many people. In today's work environment where volatility and

ambiguity are ever present, those organizations that harness end-user computing to solve their problems and do their daily business will be the favored ones in the larger organization, attracting more dollars and knowledgeable workers.

There are a number of issues surrounding end-user computing. They are: 1)cost justification, 2) executive perceptions, 3) data management, 4) training, and 5) the role of the IM department.

The individual worker based leverage of end-user computing makes it difficult to justify using the same cost-benefit procedures that have justified traditional mainframe computer systems. For example a mainframe computer system may take ten months and $150,000 to develop. Clearly, this needs to be budgeted. Yet, an end-user can develop dozens of applications on a $3,000 personal computer with $800 worth of software. The cost of traditionally justifying this $3,800 expenditure on an individual basis would be ridiculous. However, applications for end-user computing on a large scale need to be costed and budgeted. The issue to remember for individual end-user computing applications is that no finite system(s) will immediately result from the $3,800 (as an example) expenditure.

Executives have a number of fears regarding end-user computing. First, there is the perception that dollars are being wasted on seemingly frivolous computer activities. Second, they often fear that "the damn computer" will be put on their desk intimidating them to use it. Third, executives recognize that the blossoming of their own staffs as end-users means that they,

not the IM department, are accountable for the success of the work produced on the computer. The only one of these fears with any basis is the last which has little to do with technology and much to do with managerial prowess. The other two fears are essentially unfounded. When the executive begins to understand that end-users are improving their own performance with the leveraging effect on the organization, then the frivolity issue disappears. Secondly, whether or not the executive uses a desk top computer is a personal decision related to the style and needs of the executive. Its use or non-use is not an issue.[17]

Data management refers to the need to make data accessible, consistent, and secure. During the initial phases of end-user computing, this is not a critical issue but as end-user computing matures in the organization the need evolves to coordinate data and minimize their redundancy, thus demanding their consistency reliability, and security.[18] The ever present issue of how many battalions does the Army have (as many different answers as they are systems to account for this fact) flourishes once again in the end-user computing environment.

Training is an often forgotten key to the successful implementation of end-user computing. Computers will gather dust, be poorly used, and damage the work force by creating false expectations if a rigorous training program is not put in place at the same time the hardware and software are delivered to the end-users. Training, at this initial stage, involves two phases. Phase one is the blanket introductory training of all personnel who will use the computer - from clerk to executive. Phase two offers advanced courses to the computer buffs among the end-

users. Training needs to be a constant budgeted item so that new employees can be brought up to learning speed and the regular employees can improve their skills especially if new technology components are added to the end-user repetoire.

The roll of the IM department in end-user computing has historically been tenuous. Often, end-users know more than the IM people about end-user computing technology, and the IM people have the traditional tendency to want to control all aspects of end-user computing thus squelching creativity and innovation, at least in the eyes of the end-user. In addition, the critical success end-user computing skills are functional knowledge and good interpersonal relations, skills which often are not in the kit bag of the typical IM person. As end-user computing becomes more corporate-wide, these conflicts need to be resolved as ultimately the responsibility for end-user computing will become institutionalized and vested in the IM department. The main issues for the IM department become providing the IM staff with the skills (technical, functional, interpersonal) to advise the end-users and more importantly to formulate strategies and guidelines for end-user computing which will probably be different than the ones historically used for centralized mainframe computing.

The management of end-user computing becomes a mutual executive - IM department responsibility. The IM department must be involved in order to integrate end-user computing technology into the organization's information systems architecture (standards, rules, networks). Executive expertise is needed to

assure corporate end-user computing strategies and guidelines will produce the desired results.

Two management approaches which have not worked for end-user computing are the Central Czar and the Tyranny of the End-User. The Central Czar approach, usually taken by the IM department, seeks to control every nerve and cell of end-user computing, subjecting it to the same rules as mainframe computing. This approach fails because the IM department doesn't have the staff to meet end-user needs, the declining cost of computer hardware means that the Central Czar's obsession with maximizing hardware efficiency is irrelevant, the documentation and controls needed for large mainframe systems are not necessary for PC based applications, and functional managers rightly believe they can accomplish the task better than the IM department.

The Tyranny of the End-User approach has equally as many pitfalls. Incompatibility of hardware, software and communications with its associated high financial cost is the most obvious. Other ones include the end-users' need of systems support (data management, consultations on state-of-the-art technology options) beyond their ability and the inadequacy of end-user computing, in a laissez-faire mode, to harvest single applications for corporate-wide use.

An approach combining end-user innovation and IM department expertise capitalizes on the following contributions in making end-user computing an organizational success:

1. The development of a stated end-user strategy. This legitimizes and gives direction and purpose to the work of the end-user and the talents of the IM department.

2. An end-user IM department working partnership. Because end-user computing requires the re-examination of rules for justification of systems, access to data, chargeback procedures, and privacy and security, this must be worked out jointly by end-users and the technology experts.

3. Harvesting critical applications for organization-wide implementation. Regular scans need to be made of end-user applications to harvest the best ones for the benefit of the entire organization.

4. An integrated support organization. The IM department needs to provide its people with updated skills so they can successfully interact with the end-users. In addition, a selected number of IM people can to be placed, organizationally, in the functional areas with the end-users. This develops the functional and interpersonal skills of the IM staff and provides the end-user with technical expertise.[19]

By acknowledging and acting on the opportunities of end-user computing, the executive can harness the proliferation of the computer and its end-user afficionados to the mission of the organization. Once again, end-user computing success will be linked to a synergistic relationship between the IM department and the end-users.

CHAPTER V

HIGH TECH REQUIRES HIGH TOUCH

> Therefore one mode of good government is taken as being to obey the laws as laid down, but an alternative is to lay down well those laws that the people abide by ....
>
> Aristotle (384-322 BC)
> Politics

The computer has dramatically changed the roles of those in the work environment. Technologists, clerical workers, women and middle management are affected by how the computer is used in the organization, the flow of information, and the pervasiveness of the computer's seemingly relentless demands on change. The executive needs to understand these conflicts and opportunities from a people not technology oriented focus so as to positively orchestrate the computer's impact on work life.

THE TECHNOLOGISTS

Computer and telecommunications people, the technologists, are a beleagured lot. Traditionally, they have worked in their own enclaves within the organization. Too infrequently exposed to the rest of the work force, these talented technology people receive very little praise for the mentally demanding work they do and, more often then not, are quickly blamed when something goes wrong with "the computer." Their former roles in the organization are now changing as end-user computing becomes a ubiquitous and integral part of the organization's daily

operations. Interpersonal and functional skills are needed by the computer/telecommunications people in order for them to successfully deal with demanding and technologically sophisticated end-users. In addition new technical skills in personal computer operations and software, local area networks, data base management, and office automation are also needed. On a more fundamental level, the computer/telecommunications people realize that their former monopoly on the organization's information processing has ended. End-users are knowledgeable of their own needs and the capabilities and limits of computers, and it is not an unusual occurrence if an end-user knows more than a computer person about a particular PC application or communications software.

Within the Army, as the five IMA disciplines merge, there will be tensions in job responsibilities, differing levels of understanding of the information business, and the tendency to color all IMA areas in the shade of one of the disciplines rather than view the disciplines as an integrated whole. Examples of these tensions include the traditional disdain ADPers have for word processing personnel, the tendency for communicators to polarize instead of integrate their professional stakes with ADPers, and the view of both ADPers and communicators to ignore or condescend to anyone else involved in the IMA business. Executives in the Army have a major educational task in breaking down these counterproductive parochial views and getting on with the business of capitalizing on the strengths of the individual IMA disciplines to move the Army ahead by using the productivity potential and leveraging power of information technology.

CLERICAL WORKERS

Far from eliminating clerical jobs, the computer has been responsibility for their resurgence. Source data entry clerks and word processing personnel are needed to directly translate the written or spoken human word to the computer. These assembly-line type jobs require the person to type in data to a Video Display Tube (VDT) eight hours a day. The work is often boring and repetitive. If these workers are organized in pools, they are separated from the rest of their office. Further, the personnel departments classify these clerical computer workers much lower in terms of grade and salary than secretaries or administrative assistants who have varied and more non-routine responsibilities. This apparent return to 19th century piecework and time and motion procedures can produce stress, alienation, and the potential for unionization. Whereas there are no easy solutions because such type work will always be demanded in a computer environment, the executive can seek to disperse the pools of clerical workers especially if the cost of doing so is marginal. By putting clerical personnel within the organizational unit they support, these workers will feel more a part of the operating unit and be less subject to stress and alienation. And, the potential exists for their jobs to be more varied and thereby higher salaried. A secondary effect of breaking up the pools and integrating the clerical worker into the functional group is that staff professionals who may have been typing (via computer) their own reports because it was easier to do so than go through the procedural hassles of the

word processing pool now can give that work to "their own" clerks and be free to do more professional level work.

WOMEN

Although women compromise just over 50% of the U.S. labor force, they predominantly hold the low paying, less prestigious jobs. This is true also in the information systems occupations. About 80% are concentrated in the clerical type jobs, 16% are professional or technical workers, and only 6% are in management. Women are a vulnerable group for several reasons. First, because many clerical women are older, have family responsibilities, are part time workers, or are not highly educated, the change from a manual to automated environment can cause tremendous personal anxiety and possibly job loss if the employee and her boss are not well prepared for this transition. Second, the majority of women still do not pursue the hard sciences in either high school or college and recent studies show that even at the elementary school level, women still elect not to play with and eventually become proficient on personal computers. This culturally induced behavior, not any intrinsic intellectual differences between men and women, results in men getting the prestigious, high paying technology jobs. In the U.S., women hold only 25% of the computer specialist occupations and 20% of the engineering and scientific jobs.[20] Clearly the executive cannot correct the societal and educational flaws which cause this situation. But, there are a number of solutions directly related to the needs of both the individual and the organization. These are telecommuting and training.

Telecommuting is using a computer at home to accomplish work tasks. The computer can be stand alone or connected to the organization's computer networks and data bases. By 1990, it is estimated that there will be approximately 10 million telecommuters (mostly part time) in the U.S. For women who want to work part time or who have family responsibilities at home, telecommuting is an excellent solution for them as well as the organization. The worker saves the costs and time involved in commuting to and from work, can cut costs in other work related expenses such as clothing and child care, and can possibly cut housing costs by moving to a less expensive neighborhood further away from organizational headquarters. The main benefit the organization receives from clerical and support level telecommuters is increased productivity. Recent research indicates that in these areas telecommuting is associated with significant (15 per cent or more) increases in productivity. Telecommuting does have disadvantages. Workers sometimes experience feelings of isolation and a lessened degree of organizational identity as they are separated from the work force and its organizational as well as social pull. Telecommuting can also exacerbate workaholism as the computer is always compellingly there.[21] From a supervisor's point of view, telecommuting is a concern because he/she cannot daily supervise the individual. For the individual, telecommuting is somewhat professionally risky as the telecommuter could become an unknowing victim of office policies or could simply fall behind in a professional field. Finally, telecommuting may provoke

union associated issues because of the perceived return of the home sweat shops of the last century. Ways to minimize these disadvantages include having telecommuters come to the headquarters once or twice a week or establishing "organizational branch outlets" away from the headquarters where telecommuters can perform their work. In addition, some personalities are more favorably disposed to telecommuting. People who prefer peace and quiet and the opportunity to work alone are the best candidates for telecommuting.[22] In sum, the executive needs to understand the benefits and limits of telecommuting as it is a very manageable work alternative.

Little needs to be said about training except that it is an essential ingredient in getting information technology to work successfully in an organization. When planning and budgeting dollars for computers, software, and communications lines, the executive needs to put in enough money to cover the costs of initial and ongoing training not only for the IM department but also for the clerical personnel, end-users and top managers who will use the technology. The human machine interface has always been tenuous. The relationships significantly improves and the organization benefits when there is a commitment to training.

MIDDLE MANAGERS

For middle managers, the most significant change in their responsibilities regarding the computer is that with end-user computing being the rule not the exception they are now confronted with making decisions that used to be delegated to computer professionals. Typical of these decisions are:

1. How should the acquisition of hardware and software be controlled in my unit?

2. How do we develop systems interfaces with other units in the organization?

3. What kind of data can I generate and how do we share them with the rest of the organization?

4. What information technology standards must I follow and under what circumstances can I deviate?

5. How do I get myself and my staff trained in this new technology which was formerly the responsibility of the IM department?

6. What should my relationship be with the IM department?[23]

For the middle manager to respond intelligently to the information boom not only must he/she find reasonable solutions to these and other related questions but the ability to ask critical, hard questions may frequently be more important than answering the easy, mundane ones. More than once has an automated (and usually expensive) pig in a poke been bought because the manager failed to ask the right questions.

Those organizations which put a premium on ergonomics, the concept of enhancing human-machine interactions, will benefit by the power of the computer to increase productivity. Human performance improves as there is an increase in job satisfaction. This, in turn, leads to opportunities to accomplish tasks using less resources (any combination of time and money) or, by using the same resources, leveraging the tasks so that more is accomplished or they are done in a better or more innovative manner.

CONCLUSIONS

> The endless cycle of idea and action,
> Endless invention, endless experiment,
> Brings knowledge of motion, but not of stillness ....
> Where is the life we have lost in living?
> Where is the wisdom we have lost in knowledge?
> Where is the knowledge we have lost in information?
>
> T.S. Eliot
> Choruses from "The Rock"

There is nothing more fallacious than equating the technical confetti details of computers (bits, bytes, ROMs, RAMs, motherboards, vaporware, Gaussian noise, MVXs, Monte-Carlo randomizing, EBCDICs etc.) with executive wisdom in regard to the computer. A summary of the major points of this paper are therefore presented.

Strategic information planning is the business of the executive not the technologist. Similarly, the solutions to an organization's information management problems typically require better thinking, not more hardware or paperwork.

As computer resources become scarcer, more competitive, and increasingly under the eyes of Congress, information costs will be passed on to the user. Formerly "free" services such as computer programming, message traffic, PCs, digital communications, and computer processing will have price tags. Since we live in a data rich but information poor environment, the bottom line mentality of cost controls may be the only way to reasonably force apparently insatiable users into bounding their information demands. The objectives of the executive are to make

wise decisions and run effective operations. These objectives will never be met by the quest for the Holy Grail of "perfect information" (an infinite concept, anyway). Yet, if the executive understands that the quest is qualitative not quantitative, then less but better information as well as cost becomes acceptable.

End-user computing is a serendipitous by-product of computer technology advances. As such, the executive should cultivate it carefully so that creativity as well as compatibility are emphasized. End-user computing challenges two traditional ways of doing business -- the monopoly of computer services by the IM department and centralized, top-down decision-making. How well the organization adapts to end-user computing is really a measure of how committed and flexible the executive is in dealing with these challenges.

Computers work well only because people handle them wisely. With the exception of some very esoteric computer programs for artificial intelligence, the mainline thinking of computers is done by people. Therefore, it is essential that the people closest to computers -- the technologists, clerical workers, women, and middle managers -- be adequately educated and trained in computer knowledge. Equally essential is the executive's responsibility to understand and act on the human-machine interactions which occur in the work place.

Dealing with these daily artifacts of computerdom is tough but manageable. Dealing with the systems context of computers is mind stretching if not courageous. The executive will always be parrying the tendency to view the technology not the system as

the measure of knowledge in computers. The analytical, budget driven environment of the Army as well as the tangible fact of a piece of hardware are always easier to deal with than the seemingly invisible and ambiguous notions of software, data transmissions, and systems decisions. Yet, it is these intangibles which are critical to decision making in terms of performance and, in Army parlance, winning the war. Even today as the Strategic Defense Initiative is debated, the focus is on cost and pieces of equipment. The issue of battle management as controlled by software and communications is mentioned only as too hard to deal with right now. And the crucial systems issue of SDI warfighting strategy is rarely if ever critically evaluated. Thus, systems thinking demands a look beyond the comfortable and the logically known. To the busy executive, this boils down to the concept that an adequate vision of the whole, many times in today's computer world, is the preferable solution to a brilliant analysis of only one dimension.

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